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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/30/2003

Andrea Urban

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EXAMINER

AHMED, SHAMIM

ART UNIT

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1792

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/676,295	Applicant(s) URBAN ET AL.	
	Examiner Shamim Ahmed	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 December 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 10-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 10-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-8 and 10-21 have been considered but are moot in view of the new ground(s) of rejection.

As to the remarks of the true English translation of the Laermer (DE 199 57 169A), examiner pointed out that the portion of the machine translation and the figures relied upon the rejection is enough to understand the subject matter, which relied upon the rejection.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-3 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Regarding claim 1, the phrase "if an at least approximately ambipolar plasma is present" renders the claim indefinite because it is unclear whether the limitation(s) after "if" is part of the claim or not because after the phrase "if", the limitation is optional.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-8, 10 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laermer et al (DE 199 57 169A) in view of Wang et al (6,593,244).

Laermer teaches an etching process for a silicon body using a plasma comprises coupling a high frequency pulsed high frequency power with the etching body by means of applied high frequency alternating voltage, wherein the power is further modulated with a low frequency at least temporarily (abstract and pages 3-4 of the translated version of the DE 19957169 and figures 1a-1c (provided in PTO-892).

As Laermer et al teach low frequency and high-frequency with respective pulse-break (specifically page 4, paragraphs 4-5), which reads on the claimed limitation of refraining the high-frequency power at least approximately ambipolar plasma is present.

As to the ambipolar plasma, it would have been obvious to include the plasma an ambipolar status because plasma is nothing but excited or reactive species (atoms, radicals and ions, which could be in ambipolar in nature.

Laermer et al remain silent regarding etching is performed without substrate biasing, which resemble the claimed limitation of refraining from injecting a high-frequency power into the etching body via a substrate electrode.

However, Wang et al teach an anisotropically etching process to obtain very high etch rates without substrate biasing (figure 5, col.4, lines 66-col. 5, lines 1-4), which leads to easily formed deep, straight walled opening with more isotropy.

Furthermore, Wang teach the etching is performed with a pressure range of 77 millitorr to 100 torr (abstract), which leads to an ambipolar environment.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to employ Wang et al's teaching into Laermer et al's process for maintaining more anisotropy as suggested by Wang et al.

Laermer teaches that the low frequency modulation preferably in the range of 50-1000Hz (col.4, lines 10-25) and the plasma is pulsed at a frequency of 10kHz to 500kHz (see last paragraph of the page 3 of the translated version of the DE reference).

Laermer also teaches that the plasma is modulated with time and the intensity of the plasma is modulated between a maximum value and a minimum value (see figures 1a-1c).

8. Claims 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laermer et al (DE 199 57 169A) in view of Wang et al and further in view of Koshimizu (5,290,383).

Laermer et al discusses above in the paragraph 7 but fail to teach adding an inert gas in the plasma.

However, in a controlled plasma etching process of silicon substrate, Koshimizu teaches the addition of inert gas into the plasma in order to stabilize the plasma (col.14, lines 29-41).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to combine Koshimizu's teaching into modified Laermer et al's process for stabilizing the plasma as taught by Koshimizu.

9. Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laermer et al (DE 199 57 169A) in view of Wang et al and further in view of Hashimoto et al (5,779,925).

Laermer et al discusses above in the paragraph 7 but fail to teach synchronizing the modulation and the low-frequency modulation with one another.

However, Hashimoto et al teach that the RF bias is synchronized with the on/off modulation in order to reduce charging damage with out lowering the through put (col.16, lines 35-42, lines 66-col.17, line 5).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to combine Hashimoto et al's teaching into modified Laermer et al's process for reducing charging damage and for improved etching precision as taught by Hashimoto et al.

10. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Laermer et al (DE 199 57 169A) in view of Wang et al and further in view of Dockrey (4,799,991).

Laermer et al discusses above in the paragraph 7 but fail to teach that the under etching is performed using highly oxidizing fluorine compound includes ClF_3 .

However, in a process of silicon etching, Dockrey teaches both the NF_3 and ClF_3 can be used as an efficient etchant for silicon (see claims 7 and 12).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to combine Dockrey's teaching into Laermer et al's process because both NF_3 and ClF_3 are functionally equivalent as taught by Dockrey, as Laermer uses fluorocarbon gas (NF_3).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Roth (5,938,854) illustrates the typical frequency, within Larmer et al' frequency range to achieve ambipolar plasma.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (571) 272-1457. The examiner can normally be reached on Tu-Fri (12:30-10:30) Every Monday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Shamim Ahmed/
Primary Examiner, Art Unit 1792

SA
March 6, 2008